ASSESSMENT OF ADEQUACY IN THE USE OF SURGICAL ATTIRE

Avaliação da adequação no uso da paramentação cirúrgica

Evaluación de la aptitud en el uso de paramentación quirúrgica

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ABSTRACT: Objective: To analyze the adequacy of the surgical attire used by healthcare professionals who work in the surgical center of a teaching hospital in Northeastern Brazil. **Method:** This is a cross-sectional descriptive quantitative observational study. The sample consisted of 100 healthcare professionals. **Results:** The items with the best adequacy were: donning disposable shoe covers and gloves (100%), followed by places where professionals circulate with surgical scrubs and donning the surgical cap (99%). The use of safety glasses (5%) and the proper place for keeping the surgical mask (8%) had lower rates of adequacy. We found surgical mask inadequacies related to professionals who do not change the item when it gets dirty or wet and in surgeries lasting more than approximately two hours (23%). **Conclusion:** Although most (18 of the 20) items had high rates of adequacy, others presented regular and low rates. Professional categories with the highest rates of inadequacy were anesthetists (35%), nurses (27%), and nursing technicians (22%). These percentages must be improved to provide safer care for surgical patients.

Keywords: Surgicenters. Perioperative nursing. Quality control. Safety.

RESUMO: Objetivo: Analisar a adequação da paramentação cirúrgica pelos profissionais de saúde que prestam assistência em um centro cirúrgico de um hospital de ensino no Nordeste do Brasil. **Método:** Estudo transversal, descritivo, quantitativo e de natureza observacional. A amostra foi composta de 100 profissionais de saúde. **Resultados:** Os itens de maior adequação foram: no momento da colocação do propé e das luvas (100%), seguido da circulação da roupa privativa e do momento de colocação do gorro (99%). Obtiveram-se menores taxas de adequação no uso dos óculos (5%) e quanto ao local de guarda da máscara (8%). As inadequações relacionadas à máscara cirúrgica ocorreram pela não troca mediante sujidade ou umidade e em cirurgias com duração maior de duas horas aproximadamente (23%). **Conclusão:** Apesar de a maioria (18 dos 20) dos itens estar com boas taxas de adequação, outros apresentaram taxas consideradas medianas e baixas. As categorias profissionais que apresentaram maiores inadequações foram anestesistas (35%), enfermeiros (27%) e técnicos de enfermagem (22%). Esses percentuais necessitam ser melhorados, a fim de oferecer aos pacientes cirúrgicos uma assistência mais segura.

Palavras-chave: Centro cirúrgico. Enfermagem perioperatória. Controle de qualidade. Segurança.

RESUMEN: Objetivo: analizar la adecuación del apósito quirúrgico por parte de profesionales de la salud que brindan asistencia en un centro quirúrgico de un hospital universitario en el noreste de Brasil. **Método:** estudio transversal, descriptivo, cuantitativo y observacional. La muestra estuvo compuesta por 100 profesionales de la salud. **Resultados:** Los artículos más adecuados fueron: al colocar las polainas y al ponerse un guante (100%), seguido de la circulación de ropa privada y el momento en que se colocó la gorra (99%). Se obtuvieron tasas más bajas de adecuación en el uso de gafas (5%) y en términos de la ubicación de la máscara (8%). Las deficiencias relacionadas con la máscara quirúrgica ocurrieron debido al no intercambio

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debido a la suciedad o la humedad, y en cirugías que duraron más de dos horas, aproximadamente (23%). **Conclusión:** Aunque la mayoría (18 de los 20 ítems) tuvieron buenas tasas de adecuación, otros tuvieron tasas consideradas medianas y bajas. Las categorías profesionales que mostraron las mayores deficiencias fueron anestesistas (35%), enfermeras (27%) y técnicos de enfermería (22%). Es necesario mejorar estos porcentajes para ofrecer a los pacientes quirúrgicos una atención más segura.

Palabras clave: Centros quirúrgicos. Enfermería perioperatoria. Control de calidad. Seguridad.

INTRODUCTION

Surgical center (SC) is the place most prone to offering risks, and the presence of adverse events during anesthesia and surgical procedures is estimated at 37.6%[1]. According to a study conducted by the Brazilian Ministry of Health (MoH), surgical site infection (SSI) in Brazil has a rate of 11% in relation to the total surgical procedures analyzed[2-5]. Therefore, healthcare professionals must implement some care measures, including the appropriate use of surgical attire and personal protective equipment (PPE), aiming to perform surgical procedures in a proper and safe way for the patient and the professionals involved[2,6]. These facts justify our research.

Surgical attire consists of a set of barriers against the invasion of microorganisms in surgical sites and to protect professionals from exposure to the patients' blood and other bodily fluids. These barriers include surgical scrubs, surgical hat/cap, disposable shoe covers, surgical mask, safety glasses, surgical gown, and surgical gloves[5,7-10].

Changing surgical scrubs is indicated whenever the professional enters the restricted area of the SC, according to the Association of periOperative Registered Nurses (AORN), and they must be removed when leaving the SC (daily or at the end of each shift) or when the clothing is wet, dirty, or contaminated[6,11]. The use of a surgical cap is deemed appropriate when it fully covers the hair, so no strands are exposed, as they can fall into the open surgical site[6,10,12].

The Brazilian Association of Nurses in Surgical Center, Anesthetic Recovery and Center for Material and Sterilization (SOBECC)[2] recommends the use of surgical masks and eye protectors, indicating that the surgical mask should be replaced every two hours, when dirty or wet, and kept in the pocket of the surgical coat.

Footwear/disposable shoe covers must be clean, without holes, and completely closed, and their use is only intended for the SC environment. Surgical gloves should be changed in case of suspected contamination, if they are punctured, and every 90 to 150 minutes during surgery. When donning the surgical gown, professionals can only touch the inner surface, since the anterior external side is sterile, and the posterior one is unsterile[2].

Taking this into consideration, we intend to answer the following questions: which surgical attire elements have the best adequacy of use in a higher education institution? What is the percentage of adequacy according to the professional category?

Due to the importance of safe surgery, we aim at directly assisting the institution where the research was carried out by establishing the behavioral diagnosis of professionals who work in the SC, in such a way that they can make more conscious and appropriate use of the surgical attire, in addition to contributing to a safer and higher-quality provision of multidisciplinary care for patients.

OBJECTIVE

To analyze the adequacy of the surgical attire used by healthcare professionals who work in the SC of a teaching hospital in Northeastern Brazil.

METHOD

This is a cross-sectional descriptive quantitative observational study. The cross-sectional approach allows us to examine the situation of a population at a given time. The main objective of descriptive and quantitative investigations is to describe the characteristics of a certain population or phenomenon or to establish a relationship between variables, using standardized data collection techniques such as questionnaires and systematic observation[13].

The study site was a teaching hospital, located in Northeastern Brazil (in the municipality of Aracaju, state of Sergipe). This hospital provides medium and high complexity care, is considered medium-sized, and is affiliated with the Brazilian public health system (*Sistema Único de Saúde* – SUS). It has 109 hospital beds, distributed in medical, surgical, and pediatric clinics, SCs, and intensive care units.

The observation unit was the SC, which has five operating rooms (ORs), though only four are in use, a post-anesthesia care unit (PACU) with five beds, and a room for admission and preparation. On average, this unit performs 176 elective surgeries of different specialties per month.

The target population of the study consisted of 192 health professionals: 6 nurses, 26 nursing technicians, 34 surgeons, 42 anesthetists, 9 anesthesiology residents, and 75 surgery residents. However, the sample comprised 100 professionals. The sampling of this research was non-probabilistic and intentional.

The sample size was estimated as n × number of items, with *n* being the elected number of participants and "number of items" being the number of items in the research instrument. To obtain an ideal sample size for this study, five participants were chosen per each responded item, whose instrument consisted of 20 items. Hence, the sample of this research comprised 100 professionals working in the SC, which corresponds to an adequate sample, according to Mokkink[14].

Inclusion criteria for the sample were: being assigned to the SC, agreeing to participate in the research by signing an informed consent form, and being present in the sector at the time of data collection. Exclusion criteria were: healthcare professionals of the SC who work on the night shift and who were on vacation, leave of absence, day off or absent during the period of data collection.

Researchers conducted the interviews in the morning and afternoon shifts, from Monday to Friday, between June and July 2019. To that end, the authors prepared a structured questionnaire containing 20 closed-ended questions, distributed into surgical scrubs, surgical cap, disposable shoe covers, surgical mask, surgical gown, surgical gloves, and safety glasses. For the last three items, the collection was restricted to surgeons, surgery residents, and scrub technicians, and the last item included circulating technicians. The questionnaire was based on the guidelines of AORN, SOBECC, and the World Health Organization (WHO) as well as on scientific articles. Variables for each item were categorized as adequate, inadequate, and not applicable. Initially, the pilot test was administered, and the observed inconsistencies were corrected and reapplied.

Two systematic and indirect observations were made to avoid causing embarrassment, from the professional's arrival at the SC for donning the surgical attire to their exit. A researcher conducted each round of observation on different days and per professional category, in order to verify data reliability.

Collected data were compiled into a Microsoft Office Excel (version 2007) database, using the CONT.SE function. The researchers performed double data entry to minimize the possibility of errors. Next, we conducted a data analysis by absolute frequencies and simple percentage. We present the results in tables for better visualization. They were analyzed and discussed according to relevant and updated literature.

The development of the study complied with the ethical standards and procedures for research with human beings and was approved by the Research Ethics Committee, CAAE no. 68030317.4.0000.5546, under opinion number: 2,099,033.

RESULTS

A total of 100 professionals participated in the study, corresponding to 52.08% of the population. The sample consisted of 25 surgeons, 24 surgery residents, 4 anesthesiology residents, 15 anesthetists, 6 nurses, and 26 nursing technicians, with 20 circulating and 6 scrub technicians.

The mean age of the research subjects was 38.4 years – surgeons, 44.72 years; residents, 29.32 years; anesthetists, 42.8 years; nurses 35.5 years; and nursing technicians, 38.84 years.

Regarding gender, we observed a similar percentage between men and women, corresponding to 59 (59%) and 41 (41%), respectively.

We identified greater adequacy for donning disposable shoe covers and gloves (100% each), followed by places where professionals circulate with surgical scrubs and donning the surgical cap (99%), a percentage similar to that of donning the surgical gown and the way of tying the gown (96%). In contrast, items of highest inadequacy were the use of safety glasses (95%), the proper place for keeping surgical masks (92%), surgical cap model (64%), and surgical cap coverage (35%) (Table 1).

By analyzing the use of surgical attire per professional category, we found that surgeons, residents, nurses, and nursing technicians showed 100% adequacy regarding the following items: places where professionals circulate with surgical scrubs and donning the surgical cap, disposable shoe covers, and gloves. Among these items, the category of anesthetists was 100% adequate only when donning disposable shoe covers (Table 2).

We found the highest rates of inadequacy, in all professional categories, in the non-use of safety glasses and the surgical cap not fully covering the scalp, with a prevalence of surgeons and anesthetists (64 and 47%, respectively). Noteworthily, nurses and anesthetists showed 100% inadequacy concerning the proper place for keeping surgical masks (Table 2).

Regarding the general adequacy in the use of surgical attire per professional category, we found higher rates of

Table 1. Use of surgical attire according to adequacy and inadequacy criteria.

Items		Number	Adequate (%)	Inadequate (%)	Total (%)
Surgical scrubs	Circulation	100	99	1	100
	Size	100	87	13	100
Surgical cap	Donning	100	99	1	100
	Coverage	100	65	35	100
	Model	100	36	64	100
Disposable shoe covers	Donning moment	100	100	0	100
	Model	100	78	22	100
Surgical mask	Coverage	100	75	25	100
	Environment of use	100	91	9	100
	Change	100	78	22	100
	Place for keeping it	100	8	92	100
Surgical gown*	Donning	100	96	4	100
	Change	100	87	13	100
	Way of tying the gown	100	96	4	100
	Donning moment	100	84	16	100
	Size	100	93	7	100
Surgical glove*	Size	100	94	6	100
	Change	100	91	9	100
	Donning moment	100	100	0	100
Safety glasses**	Environment of use	100	5	95	100

*Surgical gown, surgical glove, and safety glasses used by surgeons, scrub technicians, and surgery residents; **safety glasses include circulating technicians.

Table 2. Use of surgical attire per professional category, according to adequacy and inadequacy criteria.

Professional category		Surgeon				Anesthetist				Resident				Nurse				Nursing technician			
Adequacy n=100 (%)		n	A	I	T	n	A	I	T	n	A	I	T	n	A	I	T	n	A	I	T
Surgical scrubs	Circulation	25	100%	0%	100%	15	93%	7%	100%	28	100%	0%	100%	6	100%	0%	100%	26	100%	0%	100%
	Size	25	80%	20%	100%	15	93%	7%	100%	28	89%	11%	100%	6	50%	50%	100%	26	96%	4%	100%
Surgical cap	Donning	25	100%	0%	100%	15	93%	7%	100%	28	100%	0%	100%	6	100%	0%	100%	26	100%	0%	100%
	Coverage	25	36%	64%	100%	15	53%	47%	100%	28	68%	32%	100%	6	67%	33%	100%	26	69%	31%	100%
	Model	25	16%	84%	100%	15	20%	80%	100%	28	32%	68%	100%	6	83%	17%	100%	26	58%	42%	100%
Disposable shoe covers	Donning moment	25	100%	0%	100%	15	100%	0%	100%	28	100%	0%	100%	6	100%	0%	100%	26	100%	0%	100%
	Model	25	92%	8%	100%	15	87%	13%	100%	28	82%	18%	100%	6	67%	33%	100%	26	58%	42%	100%
Surgical mask	Coverage	25	92%	8%	100%	15	33%	67%	100%	28	82%	18%	100%	6	50%	50%	100%	26	81%	19%	100%
	Environment of use	25	92%	8%	100%	15	73%	27%	100%	28	96%	4%	100%	6	83%	17%	100%	26	96%	4%	100%
	Change	25	80%	20%	100%	15	73%	27%	100%	28	79%	21%	100%	6	100%	0%	100%	26	73%	27%	100%
	Place for keeping it	25	92%	8%	100%	15	0%	100%	100%	28	18%	82%	100%	6	0%	100%	100%	26	4%	96%	100%
Surgical gown	Donning	25	96%	4%	100%	NA	NA	NA	NA	24	96%*	4%*	100%	NA	NA	NA	NA	6	100%**	0%**	100%
	Change	25	84%	16%	100%	NA	NA	NA	NA	24	92%*	8%*	100%	NA	NA	NA	NA	6	83%**	17%**	100%
	Way of tying the gown	25	96%	4%	100%	NA	NA	NA	NA	24	100%*	0%*	100%	NA	NA	NA	NA	6	83%**	17%**	100%
	Donning moment	25	96%	4%	100%	NA	NA	NA	NA	24	71%*	29%	100%	NA	NA	NA	NA	6	83%**	17%**	100%
	Size	25	96%	4%	100%	NA	NA	NA	NA	24	96%*	4%*	100%	NA	NA	NA	NA	6	67%**	33%**	100%
Surgical glove	Size	25	100%	0%	100%	NA	NA	NA	NA	24	87%*	13%	100%	NA	NA	NA	NA	6	100%**	0%**	100%
	Change	25	88%	12%	100%	NA	NA	NA	NA	24	92%*	8%*	100%	NA	NA	NA	NA	6	100%**	0%**	100%
	Donning moment	25	100%	0%	100%	NA	NA	NA	NA	24	100%*	0%*	100%	NA	NA	NA	NA	6	100%**	0%**	100%
Safety glasses	Environment of use	25	8%	92%	100%	NA	NA	NA	NA	24	8%*	92%*	100%	NA	NA	NA	NA	26	0%	100%	100%

*Rates refer to surgery residents; **numbers refer to scrub technicians; A: adequate; I: inadequate; NA: not applicable; n: absolute number; T: total.

inadequacy in the following order: anesthetists (35%), nurses (27%), and nursing technicians (22%) (Table 2).

We analyzed the items of the variables disposable shoe covers, surgical mask, surgical gown, and surgical gloves to understand the issue better (Table 3).

We observed that the most inadequate item of disposable shoe covers consisted of footwear with holes, with predominant use by the categories: scrub technicians (50%), circulating technicians (40%), and nurses (33%) (Table 3).

Table 3. Items of surgical attire representing adequacies and inadequacies, per professional category.

Analyzed items				Professional category													
				Surgeon		Anesthetist		Surgery resident		Anesthesiology resident		Nurse		Circulating technician		Scrub technician	
				n	x (%)	n	x (%)	n	x (%)	n	x (%)	n	x (%)	n	x (%)	n	x (%)
Disposable shoe covers	Model	Adequate	Disposable shoe covers	25	80	15	73	24	75	4	50	6	50	20	45	6	33
			Footwear without holes	25	12	15	13	24	8	4	25	6	17	20	15	6	17
		Inadequate	Footwear with holes	25	8	15	13	24	17	4	25	6	33	20	40	6	50
			Does not use them	25	0	15	0	24	0	4	0	6	0	20	0	6	0
Surgical mask	Coverage	Adequate	Full coverage throughout the surgery	25	92	15	33	24	87	4	50	6	50	20	75	6	100
		Inadequate	Partial coverage at the beginning or the end	25	4	15	27	24	0	4	0	6	17	20	5	6	0
			Partial coverage throughout the surgery	25	4	15	33	24	13	4	50	6	33	20	20	6	0
			Does not use it	25	0	15	7	24	0	4	0	6	0	20	0	6	0
	Change	Adequate	Changes it every two hours	25	0	15	0	24	0	4	25	6	0	20	0	6	0
			Changes it when it is dirty/wet	25	0	15	0	24	0	4	0	6	0	20	0	6	0
			NA	25	80	15	80	24	75	4	75	6	100	20	80	6	67
		Inadequate	Does not change it in the above situations	25	20	15	20	24	25	4	0	6	0	20	20	6	33
Surgical gown	Change	Adequate	Changes it when it is dirty/wet	25	4	NA	NA	24	0	NA	NA	NA	NA	NA	NA	6	0
			Changes it when it is contaminated	25	0	NA	NA	24	4	NA	NA	NA	NA	NA	NA	6	0
			NA	25	80	NA	NA	24	88	NA	NA	NA	NA	NA	NA	6	83
		Inadequate	Does not change it when it is contaminated	25	0	NA	NA	24	4	NA	NA	NA	NA	NA	NA	6	17
			Does not change it when it is dirty/wet	25	16	NA	NA	24	4	NA	NA	NA	NA	NA	NA	6	0
Surgical glove	Change	Adequate	Changes it after two hours	25	4	NA	NA	24	12	NA	NA	NA	NA	NA	NA	6	0
			Changes it when it is punctured	25	8	NA	NA	24	0	NA	NA	NA	NA	NA	NA	6	33
			NA	25	76	NA	NA	24	76	NA	NA	NA	NA	NA	NA	6	0
		Inadequate	Does not change it when S>2 hours	25	12	NA	NA	24	12	NA	NA	NA	NA	NA	NA	6	67
			Does not change it when it is punctured	25	0	NA	NA	24	0	NA	NA	NA	NA	NA	NA	6	0

*S: surgery; **NA: not applicable; n: absolute number; x: variable.

With respect to the use of surgical masks, we identified the highest rates of inadequacy in anesthetists (67%), who presented partial coverage at the beginning or end of surgery (27%), partial coverage throughout the surgical procedure (33%), and non-use of the surgical mask (7%), followed by nurses (50%). As to the periodicity for changing the surgical mask, we detected the highest rates of inadequacy among scrub technicians (33%), surgery residents (25%), and surgeons (20%) (Table 3).

Regarding the recommended intervals for changing the surgical gown, we found no changes made by scrub technicians, surgeons, and surgery residents in 17, 16, and 8% of the surgeries, respectively (Table 3).

Concerning the change of surgical gloves, which must be performed two hours after the beginning of surgery and in case of perforation, we identified the highest percentages of inadequacy in the following categories: 67% among scrub technicians, 12% among surgery residents, and 12% among surgeons (Table 3).

DISCUSSION

The use of surgical attire is important because it creates a microbiological barrier against the penetration of microorganisms directly into the patients' surgical site, which may come from patients themselves, the professionals involved in the surgery, and equipment, among others[9,10,15].

The size of surgical scrubs is adequate when it fully covers the waist and lower limbs, avoiding the exposed area[10,15,16]. In our study, we found that 87% of the observations were adequate (Table 1). This finding is relevant, since the use of surgical scrubs is one of the most effective tools in preserving the health and physical integrity of healthcare professionals, thus assisting in preventing contamination. Therefore, its incorrect use may affect this process[6].

Regarding the surgical cap, according to the scientific literature, it must fully cover the scalp, have an elastic opening, and it can be made of reusable cotton or *Spunbond Meltblown Spunbond* (SMS) fabric, i.e., single-use non-woven fabric[2,12,15]. Over half (65%) of healthcare professionals properly covered their heads. We found similar rates of inadequacy in relation to the surgical cap model used (Table 1). A study carried out in a teaching hospital in the city of Belo Horizonte (state of Minas Gerais, Brazil)[7] found a different result – the use of surgical cap was inadequate about nine times less than in our study.

Surgical masks must completely cover the nose, mouth, and cheeks, and should be kept in the pocket of the surgical scrubs. Putting the mask on the neck is inappropriate, as it can lead to early exposure to bacterial colonization[6,12]. Its use is mandatory when entering the operating room and the toilet[2,15]. The use of surgical masks in places where it is mandatory was adequate and performed, in our research, by 91% of the professionals (Table 1), corroborating a study that evaluated adherence to measures to prevent SSI in the SC of a public hospital[7]. Good adherence to the use of surgical masks may be justified because there are no controversies regarding its effectiveness in controlling infections

The surgical gown should fully cover the torso from the neck, upper limbs up to the wrists, and lower limbs up to the knees, allowing freedom of movement. It must be used by surgeons, surgery residents, and scrub technicians right after the degermation and drying of the hands, and must be worn until the end of the surgery and changed in case of contamination or whenever wet or dirty[10,15]. In this regard, most of the participants properly used the item, accounting for almost all of the observations concerning donning the gown, the way of tying it, its size, and changing the gown (Table 1). These results are similar to those observed in a study[7] in which the entire surgical team properly used the surgical gown.

Surgical gloves must be of good quality as to flexibility, impermeability, and resistance to surgical duration and movements. Therefore, they must be made of latex, sterilized, disposable, and replaced whenever they are punctured and in long surgeries[6,10,15]. This item presented the highest rates of adequacy in relation to its timely change and donning, close to all observations (Table 1). These results corroborate a study that found 100% adequacy in the correct use of gloves[7]. This finding is extremely relevant, since, as reported by some authors[12,17], the use of sterile surgical gloves is a paramount measure for preventing SSI, acting as a physical barrier for microorganisms present in the hands of healthcare professionals, in the environment, and in patients. Furthermore, integrity failure enables the transfer of microorganisms, doubling the risk of SSI.

The use of safety glasses is indicated for occupational protection, since they prevent direct contact of the eyes with the patients' exudates[10,15,18]. Nevertheless, we have observed resistance to adherence, probably because they reduce visual acuity and for the fogging of the lens due to breathing[10,15]. When selecting safety glasses, professionals must consider the presence of wide visors made of acrylic or glass and face

shields against fluids[15]. The lack of supply of this PPE, as determined by the legislation in force, might justify the fact that this item presented the lowest adherence rate (Table 1) among all items of surgical attire, corroborating the study conducted by Freiberger et al.[18]

Scrub shoes and disposable shoe covers create barriers against pathogenic organisms present in footwear. Their relevance in controlling SSI lies in the likelihood of hand contamination when touching the shoes[15]. Currently, their mandatory use is controversial, since they do not prevent environmental contamination and can transfer microorganisms to the hands of workers when they touch their feet to remove their shoes and do not wash them straightaway[12,19]. Thus, according to some authors[9,12], disposable shoe covers should not be considered an environmental protection barrier, since their use only prevents the shoes from being soiled by blood and other bodily fluids.

In our study, this PPE had the highest adequacy rate (100%) in all categories (Table 1). It is noteworthy that the PPE with the best adequacy was precisely the one with no evidence of effectiveness in preventing infections. Different results were obtained in a study with lower usage rates[7], probably because the professionals were aware of the lower importance of disposable shoe covers due to controversies in relation to their effectiveness in preventing surgical infections.

After analyzing the adequacy / inadequacy of surgical attire per professional category, the use of safety glasses and surgical masks had the highest rates of inadequacy. Regarding the first, we found rates of inadequacy in surgeons (92%), surgery residents (92%), and scrubs technicians (100%) (Table 1). Although the use of safety glasses by surgeons, surgery residents, scrub technicians, and, sometimes, by circulating technicians and anesthetists (when there is a risk of splashing) is recommended from the beginning to the end of the surgery, our results stand out because this item had the highest percentage of inadequacy (about 100%) in all categories[15]. Our results were similar to those of other studies[7,18,20], which proves the difficulties of the surgical team in adhering to the use of safety glasses.

The PPE with the second-highest rate of inadequacy per professional category was the surgical mask regarding the proper way of using it. We found that anesthetists (67%) and nurses (50%) had the highest rates of inadequacy in the observed situations (Table 1). The result is concerning, given that, according to the literature[2], the proper use of surgical mask is an effective measure in the control of surgical infections. Studies[7,12] with much higher adherence to the correct use of surgical masks, when compared with our research, presented different results.

We highlight as adequate the circulation of professionals wearing surgical scrubs, the size and the moment of donning the surgical glove by surgeons, residents, and nursing technicians. This finding is significant, since, according to the literature, surgical gloves must be put on close to the start of surgery and after donning the gown, thus reducing exposure to microorganisms[21].

As for the characterization of the main items of surgical attire (surgical gloves and masks), the correct change of gloves occurred mainly in cases of perforation and surgeries lasting more than two hours and were made by surgeons, surgery residents (88% each), and scrub technicians (33%) (Table 3). Authors of another study found a divergent result, with a higher percentage of changes made by surgeons, followed by nursing assistants and scrub technicians in equal percentages[7]. We underline a study[17] that pointed out the importance of evaluating the quality of the products, since tests performed on surgical gloves did not present risk of perforations.

With respect to the mandatory change of surgical masks in surgeries lasting more than two hours and when they are wet and dirty, no changes were made by scrub technicians in 33% of the observations; by surgery residents in 25%; and by surgeons in 20% (Table 3). Despite the low rates of inadequacy, they are nonetheless significant, considering their importance as microbiological barriers[2].

Finally, the use of PPE and its low adherence among healthcare professionals in invasive procedures still represent a behavior that directly or indirectly influences the safety of the professional and, especially, of the patient, posing risks to them[20].

In this sense, among the tasks performed by healthcare professionals working in surgery to prevent factors related to this procedure, researchers include adequate surgical attire[7] and the importance of its use as a means to reduce infection rates[12]. Therefore, within the surgical team, nurses must have a prominent role as relevant agents in providing safe care, as well as guiding and supervising the use of surgical attire.

The limitations of our study involved those traditionally related to observational research. In this specific case, we can mention: the period of observation of surgical procedures, since some surgeries lasted less than two hours, cancellation of surgeries, and shortage of material resources.

CONCLUSION

After analyzing the data, we can infer that most, 18 out of a total of 20 (90%), surgical attire items showed percentages of adequacy ranging from 5 to 100%. We highlight donning the surgical glove and disposable shoe covers, with 100% adequacy, while the lowest rates corresponded to the use of safety glasses (5%) and the proper place for keeping the surgical masks (8%).

The professional categories with the highest rates of inadequacy were anesthetists (35%), nurses (27%), and nursing technicians (22%).

Moreover, we concluded that, although most of the observed items had percentages equal to and over 75% of adequacy, others had percentages deemed very low (5 and 8%). Hence, rates must be urgently improved in order to provide surgical patients with increasingly safer care.

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